3.3 b more rules for derivatives

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Product Rule

$$\frac{d}{dx}(u \cdot v) = u\frac{dv}{dx} + v\frac{du}{dx}$$

$$\frac{d}{dx}\, x^2 \sin x = x^2 \cos x + \sin x \cdot 2x$$

$$\frac{d}{dx}\,(x^3+2x+3)(x^7-4) =$$

$$(x^3+2x+3)(7x^6) + (x^7-4)(3x^2+2)$$

$$\frac{d}{dx}\, x^2 \sin x \cos x =$$

$$x^2 \sin x \cdot (-\sin x) + \cos x \left(x^2 \cos x + \sin x \cdot 2x\right)$$

Quotient Rule

$$\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$$

$$\frac{d}{dx}\left(\frac{x^3}{\sin x}\right) = \frac{\sin x \cdot 3x^2 - x^3 \cos x}{\sin^2 x}$$

$\sin^2 x = (\sin x)^2$

$$\frac{d}{dx}\left(\frac{x^2-1}{x^2+1}\right) = \frac{(x^2+1)2x - (x^2-1)2x}{(x^2+1)^2}$$

$$\frac{d}{dx}\left(\frac{x^2 \sin x}{x^2+1}\right) =$$

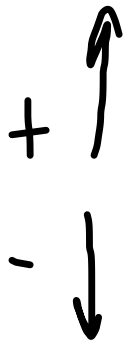
$$\frac{(x^2+1)(x^2\cos x + 2x\cdot\sin x) - (x^2\sin x)(2x)}{(x^2+1)^2}$$

3.4 a

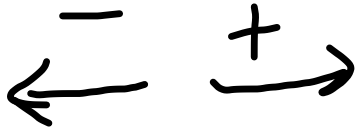
position s

velocity $v = \frac{ds}{dt}$

acceleration $a = \frac{dv}{dt} = \frac{d^2s}{dt^2}$



speed $= |\text{velocity}|$



3.4 EX 4

$s = 160t - 16t^2$

$v = 160 - 32t$

$a = -32$

t = time (sec)

s = height (ft)

a) how high?

$v = 0 = 160 - 32t$

$5_{sec} = \frac{160}{32} = 32t$

$s_{max} = 160 \cdot 5 - 16 \cdot 5^2 = 400$ ft

b) $256 = 160t - 16t^2$ solve for t

$t = 2, 8$ $\quad v(2) = 96$ ft/sec

$v(8) = -96$ ft/sec

c) $a = -32 \frac{\text{ft/sec}}{\text{sec}} = \text{ft/sec}^2$

EX 5 t parametric graphing

$s = t^2 - 4t + 3$

on $y = 2$